SURREBUTTAL TESTIMONY AND EXHIBIT OF

NORMAN K. RICHARDSON, JR.

ON BEHALF OF

THE SOUTH CAROLINA OFFICE OF REGULATORY STAFF

DOCKET NOS. 2017-207, 305, 370-E

IN RE: JOINT APPLICATION AND PETITION OF SOUTH CAROLINA ELECTRIC & GAS COMPANY AND DOMINION ENERGY, INCORPORATED FOR REVIEW AND APPROVAL OF A PROPOSED BUSINESS COMBINATION BETWEEN SCANA CORPORATION AND DOMINION ENERGY, INCORPORATED, AS MAY BE REQUIRED, AND FOR A PRUDENCY DETERMINATION REGARDING THE ABANDONMENT OF THE V.C. SUMMER UNITS 2 & 3 PROJECT AND ASSOCIATED CUSTOMER BENEFITS AND COST RECOVERY PLANS

Q. PLEASE STATE YOUR NAME, BUSINESS ADDRESS AND OCCUPATION.

A. My name is Norman K. Richardson, Jr. My business address is 32 Dunaire Court, Mableton, Georgia 30126. I am President of Anchor Power Solutions, LLC.

Q. DID YOU FILE DIRECT TESTIMONY AND EXHIBITS IN THIS PROCEEDING?

A. Yes. I filed direct testimony with the Public Service Commission of South Carolina ("Commission") on September 24, 2018.

Q. WHAT IS THE PURPOSE OF YOUR SURREBUTTAL TESTIMONY?

A. The purpose of my testimony is to address the assertions in the rebuttal testimony of South Carolina Electric & Gas Company ("SCE&G") witness Dr. Joseph M. Lynch, and to present the results of additional economic analysis of the V.C. Summer Units 2 & 3 Project ("NND Project") as of March 31, 2015.

Q. PLEASE PROVIDE ADDITIONAL DETAILS ON YOUR RELEVANT WORK EXPERIENCE.

A. I am providing my curriculum vitae as Surrebuttal Exhibit NKR-1, which details my experience in resource planning and economic analysis.

Q. IF ECONOMIC STUDIES OF THE NND PROJECT ARE NOT REQUIRED BY STATUTE, WHY DID YOU REVIEW, CORRECT, AND SUPPLEMENT THE STUDIES SUBMITTED BY SCE&G IN THESE PROCEEDINGS GOING BACK TO 2015?

A. As the Office of Regulatory Staff ("ORS") witness Gary Jones explains in his direct and surrebuttal testimonies, ORS determined that NND Project costs incurred after March 12, 2015 (the date of the filing by SCE&G in Docket No. 2015-103-E ("Petition")) were imprudent because SCE&G deliberately and repeatedly misled the Commission and ORS by withholding key information on the projected construction schedule, which included the decision to move forward with a thorough independent assessment of the project to be conducted by Bechtel Power Corporation ("Bechtel"). If ORS had known at the time SCE&G filed the Petition that an assessment of the schedule was planned and underway just after the 2015 hearing, ORS would have requested that the Petition for revision to the schedules be withdrawn pending the results of the review. That assessment, which was concealed until late 2017, included projected commercial operation dates that were 18 to 36 months after the dates filed by SCE&G in the Petition.

I was retained by ORS to perform an analysis to demonstrate the impact of the Bechtel report's projected commercial operation dates on the economics of the NND Project. My analysis demonstrates that had the dates included in the Bechtel assessment

been utilized in a corrected version of the analysis Dr. Lynch offered in the Petition ("Lynch 2015 Study"), it would reveal that the NND Project would have been uneconomic to continue. This would have most certainly prompted further investigation by ORS and might have led to a different decision than the one reached by both ORS and the Commission based on SCE&G's misleading and deceptive information.

Q. WHY WAS IT NECESSARY TO USE A CORRECTED VERSION OF THE LYNCH 2015 STUDY TO ANALYZE THE IMPACT OF THE BECHTEL DATES?

A. My analysis includes corrections to technical errors in the 2015 Lynch Study to provide an unbiased view of the economics of the NND Project with the Bechtel dates and does not change any of the assumptions with the benefit of hindsight. As I state in my direct testimony and Dr. Lynch points out in his rebuttal testimony, some of those corrections are favorable to the NND Project, and others are unfavorable or have little impact. All these corrections except for those related to Accumulated Deferred Income Tax ("ADIT") were also made by Dr. Lynch in the economic analysis submitted in Docket No. 2016-223-E ("Lynch 2016 Study") and Docket No. 2017-370-E ("Lynch 2017 Study"). For the ADIT calculations related to the construction projects, Dr. Lynch concedes in his rebuttal testimony that there was a flaw in SCE&G's calculations related to the time elapsed between the study period and the online dates. As for the ADIT related to the abandonment costs, Dr. Lynch contends that although this was in fact claimed by SCE&G in 2017, that it is uncertain whether this would have been the case in 2015. However, there is no reason to believe that an abandonment decision in 2015 would have been treated any differently than the decision made in 2017.

Q. WHY DID YOU SELECT A DELAY OF 24 MONTHS WHEN THE BECHTEL DATES RANGED FROM A DELAY OF 18 MONTHS TO 36 MONTHS?

A. I chose to apply a 24-month delay to both units to maintain as much consistency as possible with the Lynch 2015 Study, while still using dates within the range of the Bechtel projection (18 to 26 months for Unit 2 and 24 to 36 months for Unit 3). In addition to the analysis of a 24-month delay that I presented in my direct testimony, I also performed an alternative analysis using the earliest possible dates from the Bechtel report, which would place Unit 2 in service in December 2020, and therefore qualify for the federal production tax credit. In this alternative analysis, the most likely scenario cited in the Lynch 2015 Study shows that abandoning the NND Project and replacing with the combined cycle alternative results in an economic benefit of $55 million per year over 40 years. Eight of the nine scenarios using the base load forecast show an economic advantage over 40 years for abandoning the NND Project (the most extreme scenario breaks even after 30 years):

	Base Gas	50% Higher Gas	100% Higher Gas
$0 CO2 Price	($286)	($180)	($85)
$15 CO2 Price	($222)	($119)	($12)
$30 CO2 Price	($157)	**($55)**	$48

Q. WHY ARE THE COSTS OF THESE DELAYS SO MUCH HIGHER THAN WHAT DR. LYNCH ANALYZED ONE YEAR LATER IN 2016 IN RESPONSE TO ORS AUDIT INFORMATION REQUEST ("AIR") 1-38 IN DOCKET NO. 2016-223-E?

A. That analysis, shown in Exhibit JML-1 of Dr. Lynch's rebuttal testimony, includes an increase in the owner's cost associated with the delays, but does not include any increase in the EPC costs, and in fact has a credit of $371.8 million in liquidated damages and penalties from Westinghouse Electric Company. This is due to the fixed price EPC offer

SCE&G accepted on May 26, 2016. While this was appropriate to consider in the 2016 analysis, it cannot be applied to an analysis in 2015 before the fixed price EPC offer was accepted. Without that credit, the cost increase that Dr. Lynch calculated is consistent with the analysis I present for 2015.

Q. WHY ARE YOU CLAIMING THE LYNCH 2016 STUDY ASSUMES THE TRANSMISSION PORTION OF THE NND PROJECT WOULD NOT BE ABANDONED, WHEN DR. LYNCH STATES THIS IS NOT THE CASE?

A. The supporting spreadsheets for the Lynch 2016 Study that were submitted to ORS by SCE&G in response to AIR 5-26 clearly show this. Cells G8 and H8 of the sheet "Change.PLAN" are the transmission costs used for the combined cycle alternatives and are set to the forecast NND Project transmission costs of $684.4 million. This means that in the abandonment case, the nuclear transmission costs are simply shifted to the combined cycle alternatives. By comparison, the Lynch 2015 Study assumed transmission costs of only $24.9 million for the combined cycle alternatives. In addition, cell C3 of the "BLRA Revenue" sheet contains the entry "2016 filing amended for transmission removal."

Q. IN HIS REBUTTAL TESTIMONY, DR. LYNCH SUGGESTS THAT YOUR DIRECT TESTIMONY CONCLUDES THE SELECTION OF A RATE-BASED COMPLIANCE OPTION FOR THE NUCLEAR CASE IS NOT APPROPRIATE. IS THIS ACCURATE?

A. No, it is not. I would agree that if the proposed Clean Power Plan were implemented, South Carolina would have likely chosen the rate-based compliance option if the NND Projects were completed, and the mass-based compliance option if they were abandoned. My testimony points out that the Lynch 2016 and 2017 Studies failed to

quantify any CO_2 costs or benefits for the NND Project option, and grossly overstated CO_2 costs for the Combined Cycle (Abandonment) option.

Q. PLEASE EXPLAIN WHY YOU DRAW THIS CONCLUSION.

A. Dr. Lynch correctly states that in a rate-based compliance option, the rate formula for emission rate credits ("ERC") is:

Target Rate (lb/MWh) = Actual Emissions (lbs) / (Generation (MWh) + ERCs),

where the Target Rate is set by the United States Environmental Protection Agency ("EPA") and decreases over the first several years of the proposed Clean Power Plan. If a utility's actual emission rate is less than the Target Rate, the ERCs are negative, meaning it can sell those credits or bank them for future use. If the rate is greater than the Target Rate, the ERC's are positive, and it must buy those credits (or withdraw previously banked credits). ERC's are traded based on a $/MWh price instead of $/ton, since that is how the rate credits are measured.

The CO_2 scenarios of $15/ton and $30/ton that have been used in all of SCE&G's economic analysis cannot be directly applied to a rate-based compliance option, and the PROSYM model used by SCE&G to capture emission costs does not recognize this option. So, Dr. Lynch simply assumed a CO_2 cost rate of $0/ton in all 27 scenarios for the NND Project, where 18 of these scenarios are duplicates of the other 9. In other words, in SCE&G's analysis there is absolutely no difference in generation from coal units in the "high" CO_2 cost scenarios, which violates the economic dispatch principle that is fundamental to resource planning.

In a mass-based compliance option the formula for traded allowances is:

Target Emissions (tons) = Actual Emissions (tons) – Traded Allowances,

where the Target Emissions (or Allocated Allowances) is set by the EPA and decreases over the first several years of the proposed Clean Power Plan. If a utility's actual emissions are less than the Target Emissions, the Traded Allowances are negative, meaning it can sell those allowances or bank them for future use. If the emissions are greater than the Target, the Traded Allowances are positive, and it must buy those allowances (or withdraw previously banked allowances). The Lynch 2016 and 2017 Studies effectively assume zero Targeted Emissions, meaning that every ton emitted must pay the $15/ton or $30/ton price, depending on the scenario. Therefore, the CO_2 costs are grossly overstated for the combined cycle alternative in the Lynch 2016 and 2017 Studies. The Lynch 2015 Study assumes a mass-based compliance option for both the NND Project and combined cycle cases, and the difference in CO_2 costs between these cases is not dependent on the Target Emissions, which is why ignoring this has no impact in the prior studies.

Q. WILL YOU UPDATE YOUR TESTIMONY BASED ON INFORMATION THAT BECOMES AVAILABLE?

A. Yes. ORS fully reserves the right to revise its recommendations via supplemental testimony should new information become available not previously provided by SCE&G, or from pending state and federal investigations and lawsuits.

Q. DOES THIS CONCLUDE YOUR SURREBUTTAL TESTIMONY?

A. Yes, it does.

Norm Richardson – Curriculum Vitae

Summary

- Over twenty-four years of experience in developing software, data, and consulting solutions for power market analysis
- A recognized expert in market price forecasting, resource planning, and asset valuation, providing written and oral testimony in regulatory proceedings

Professional Experience

Oct 2014 – Present Anchor Power Solutions Atlanta, GA

President (Oct 2014 – Present)

Founded a new company that provides software and consulting services related to power system planning, market price forecasting, asset valuation, and economic transmission analysis. Created the EnCompass software model which uses Mixed Integer Programming to optimize unit commitment and resource selection decisions.

Sep 2009 – Sep 2014 Ventyx, an ABB Company Atlanta, GA

General Manager, Energy Portfolio Management (Jan 2010 – Sep 2014)

Responsible for all Ventyx energy software and services, including:

- Analytics Software – Planning and forecasting models and simulation data, which included PROMOD IV for security constrained unit commitment and economic dispatch
- Intelligence -- Velocity Suite data service for North American energy markets
- Advisors -- Consulting products and services, including the Power Reference Case products
- Commercial Operations -- Energy Trading & Risk Management, Market Bidding and Settlements, and Retail Operations with Demand Response Management

Vice President, Power Markets (Sep 2009 – Jan 2010)

- Directed the development of the North American Power Reference Case, a syndicated 25-year forecast of power, gas, coal, renewable energy, and emission allowance markets covering the NERC power systems.
- Managed a team of consultants that performed custom market price forecasts, asset valuations, and risk analysis.

Jan 2008 – Sep 2009 SNL Energy Charlottesville, VA

Associate Director, Energy Research

Directed the Power Markets and Fuels database service, including power plant operations, area load and prices, natural gas pipelines, coal mines, and development projects for transmission, generation, and environmental controls. Established practices and procedures for collecting and validating Power Markets data from FERC, EIA, EPA, NERC, and other sources.

Apr 1994 – Dec 2007 NewEnergy Associates Atlanta, GA

Vice President, Energy Forecasting and Planning (Oct 2005 – Dec 2007)

- Head of the planning practice area including three divisions (power, natural gas, and finance) responsible for product development, support, and training
- Served on Western Electric Coordinating Council (WECC) committees on model and data development, and designed the Portable Data Format used to share data among all members for economic transmission planning

- Led the design and implementation of a Security Constrained Unit Commitment (SCUC) model for use in Entergy's Weekly Procurement Process (WPP) for granting weekly transmission rights

Director, Energy Markets and Asset Analysis (Feb 2000 – Oct 2005)

Product Manager for NewEnergy's PowerBase Suite of software and databases for the North American power markets, including the PROMOD IV software.

Manager, Energy Market Systems (Sep 1996 – Feb 2000)

Directed a team of software developers working on products (MarketPower, Nostradamus) that forecast price and demand for electricity and natural gas.

Consulting Projects

- On behalf of the South Carolina Office of Regulatory Staff, reviewed South Carolina Electric & Gas's market modeling and resource planning assumptions related to V.C. Summer Nuclear Units 2 and 3.
- On behalf of the Hawaii Division of Consumer Advocacy, reviewed and prepared an alternative analysis of the production cost modeling used by Hawai'i Electric Light Company (Big Island), Hawaiian Electric Company (Oahu), and Maui Electric Company for their 2016-17 rate cases.
- Forecasted potential curtailment of utility-scale solar projects on the Hawaiian Islands of Oahu and Maui.
- Prepared an assessment report for the Mexico wholesale electric market on behalf of a power project developer.
- Assessed the Hu Honua biomass project on the island of Hawaii, including detailed simulations of potential capacity factors under various oil price forecasts.
- Prepared market assessments and price projections to support the acquisition of an ownership share of new nuclear development, and the sale of a portfolio of wind generation assets.
- Provided written testimony to the Wisconsin Public Service Commission in support of market price forecasts used for evaluating the sale of We Energies' Point Beach Nuclear Power Station.
- Provided oral testimony to the Michigan Tax Tribunal with regard to market price forecasts used to develop valuations for power plants in Michigan.
- Served as Energy Consultant to the Committee of Unsecured Creditors of Mirant Americas Generation, LLC (MAGI) during Mirant bankruptcy proceedings, leading a team that provided forecasts of energy and capacity prices, and operation and gross margin of MAGI assets throughout the United States.
- Forecasted energy and capacity revenues, operating expenses, and cash flow for several power plants that were being sold or refinanced, at the request of investment banks and independent power producers.
- Determined future capacity needs for Georgia Energy Cooperatives and analyzed bids received from power suppliers to determine the optimal selection of resources.
- Assisted Vectren Energy Delivery of Indiana in developing an Integrated Resource Plan that considered options such as new unit construction, plant upgrades, and DSM programs.
- Forecasted distributions of southeast electric market prices and natural gas consumption of Oglethorpe Power's existing and planned gas-fired generation, based on gas price and weather volatility.
- Forecasted distributions of generation, production costs, and operating income for Dominion Virginia Power based on weather uncertainty and volatility of gas, oil, and coal prices.
- Produced pro-forma financial statements for Old Dominion Electric Cooperative in order to obtain financing for the construction of two combustion turbine plants.

Presentations and Publications

- "Assessing the Impacts of the Introduction of New Turbine Technologies on the Wholesale Market," Infocast ERCOT Market Summit 2016, February 2016
- "Risk Management Modeling for Resource Planning," G&T Resource Planning Conference, October 2011
- "Impacts of the GCC-IA Backbone on Generation and Transmission Planning," EU-GCC Clean Energy Network Discussion Group Meetings, May 2011
- "Economic Transmission Expansion Planning", FERC Technical Conference for Enhanced Wide-Area Planning Models, June 2010

- "Introduction to Power Markets", SNL CFE Analyst Training in the Power & Gas Sector, December 2008
- "Including Risk Analysis in Power Price Forecasting," Natural Gas & Electricity, September 2007
- "Maximizing Transmission Planning Efficiency", Electric Light & Power, Mar/Apr 2007
- "Market Price Forecasting with Risk Analysis," EUCI Resource & Supply Planning Conference, January 2007
- "Introduction to Resource Planning and Supply Optimization," EUCI Resource & Supply Planning Pre-Conference Workshop, January 2006 & January 2007
- "The Risks and Benefits of Capacity Markets to Generators," Electric Power Conference, May 2006
- "Discovering the True Value of Capital Improvements," Electric Power Conference, May 2006
- "Searching for the Investment Signal", Platts Insight, October 2005
- "Emissions Compliance: Optimizing your Asset Strategy is a Balancing Act," Harts Energy Markets, April 2005
- "Price Volatility: Modeling Techniques for Analyzing and Assessing Risk and Volatility," Infocast Wholesale Pricing Conference, November 2000

Education

- Master of Science in Electric Engineering, 1994, Georgia Institute of Technology, Atlanta, GA
- Bachelor of Science in Mathematics, 1992, Furman University, Greenville, SC